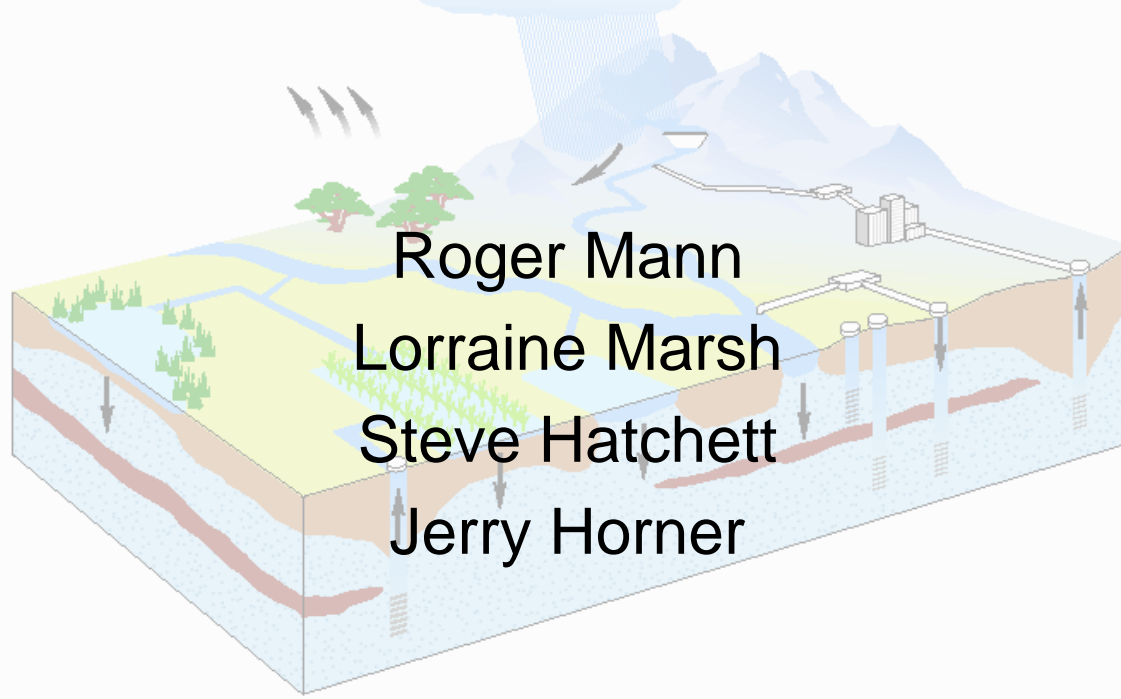


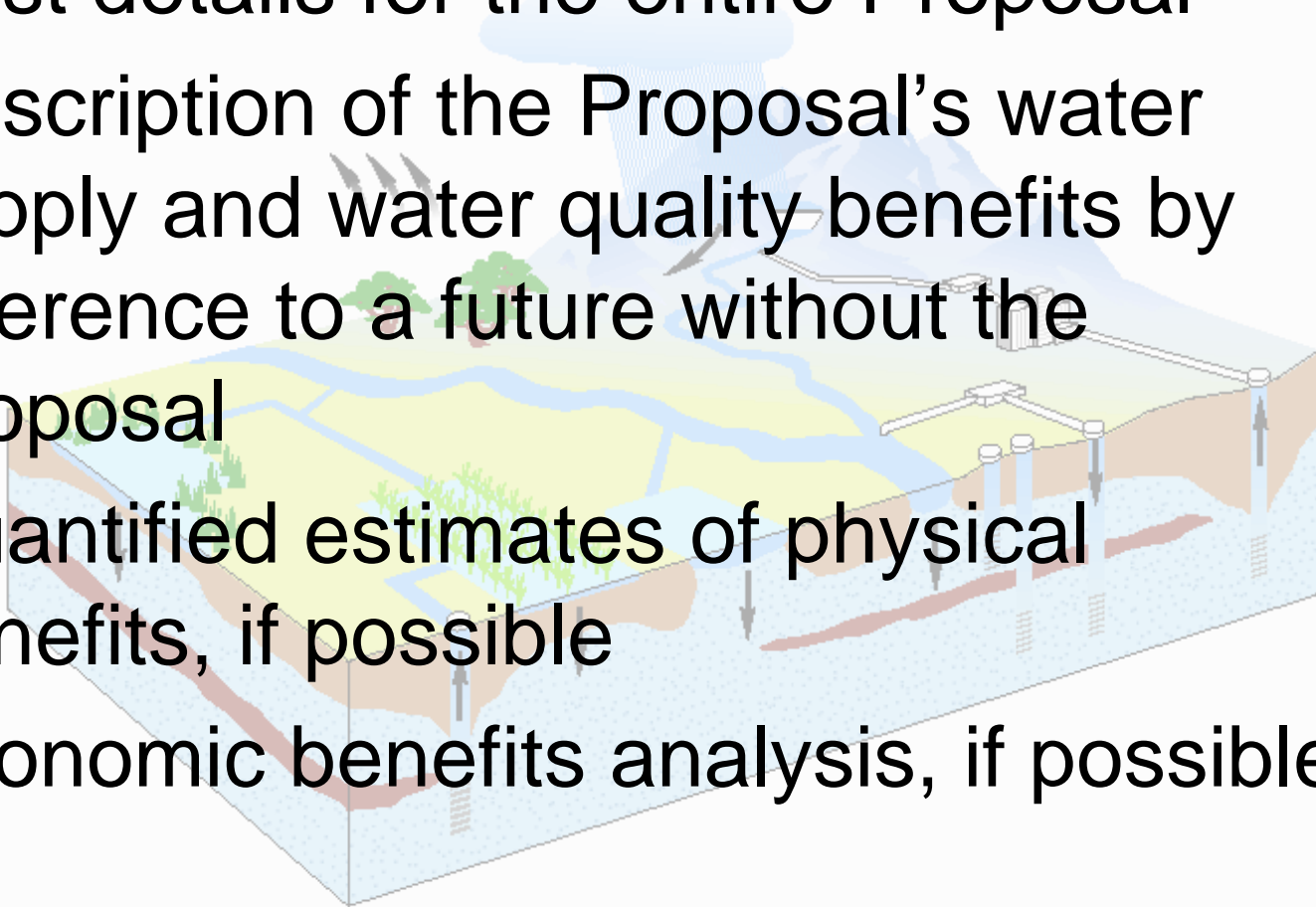
# Economic Analysis of Water Supply and Water Quality Benefits

## IRWM Round 2



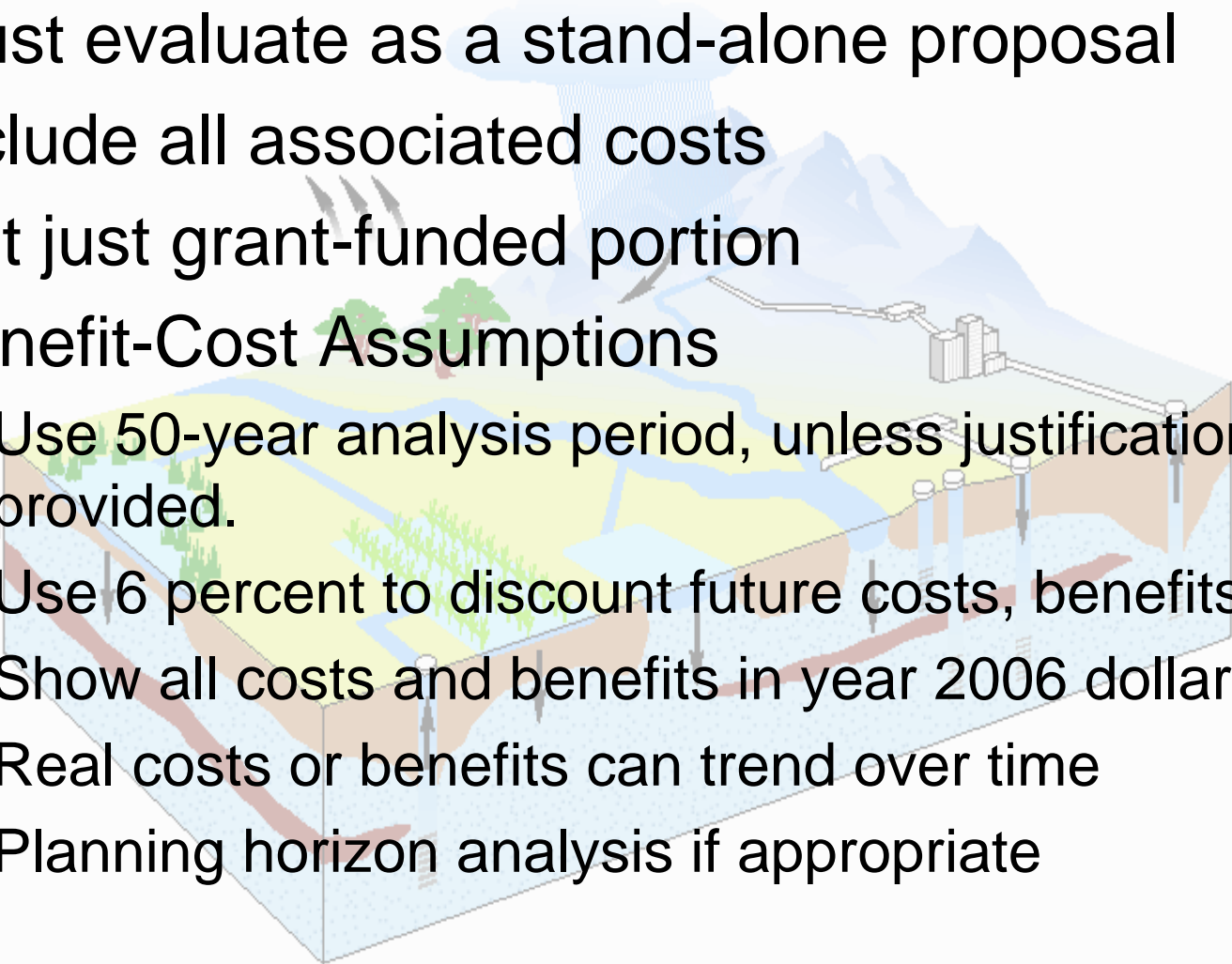
# Each Proposal Must Include

- Cost details for the entire Proposal
- Description of the Proposal's water supply and water quality benefits by reference to a future without the Proposal
- Quantified estimates of physical benefits, if possible
- Economic benefits analysis, if possible

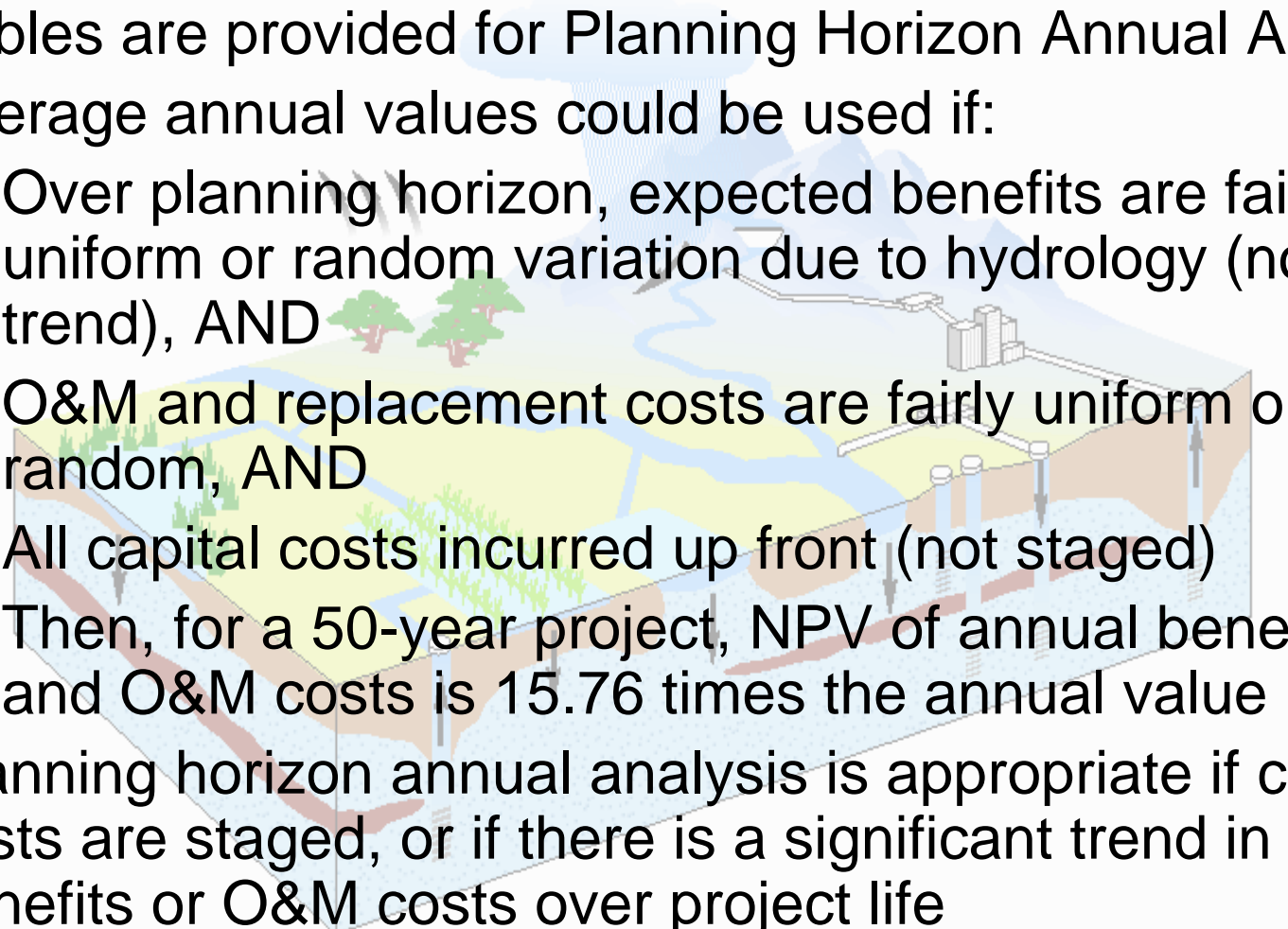


# Required Economic Assumptions

- Must evaluate as a stand-alone proposal
- Include all associated costs
- Not just grant-funded portion
- Benefit-Cost Assumptions
  - Use 50-year analysis period, unless justification provided.
  - Use 6 percent to discount future costs, benefits
  - Show all costs and benefits in year 2006 dollars
  - Real costs or benefits can trend over time
  - Planning horizon analysis if appropriate



# Why Use Planning Horizon Annual Analysis?

- Tables are provided for Planning Horizon Annual Analysis
  - Average annual values could be used if:
    - Over planning horizon, expected benefits are fairly uniform or random variation due to hydrology (no trend), AND
    - O&M and replacement costs are fairly uniform or random, AND
    - All capital costs incurred up front (not staged)
    - Then, for a 50-year project, NPV of annual benefits and O&M costs is 15.76 times the annual value
  - Planning horizon annual analysis is appropriate if capital costs are staged, or if there is a significant trend in benefits or O&M costs over project life
- 

# Example of a Project Needing Planning Horizon Annual Analysis

Expected yield is delayed or shows a trend over time	So benefits are delayed or show a trend	Capital cost does not all occur in year zero	O&M costs are delayed or show a trend
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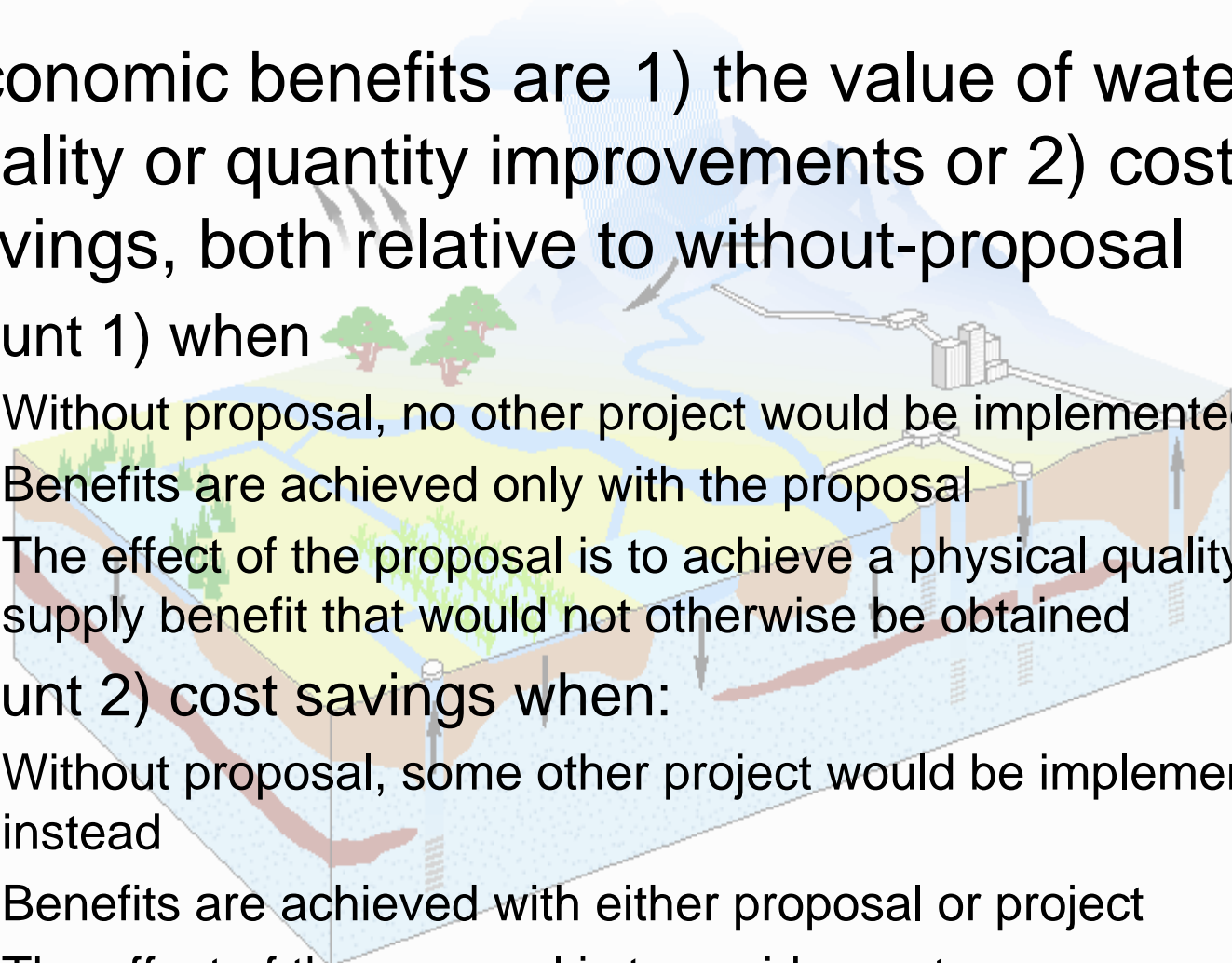
**Benefit= \$200 x**

Year/row	AF Yield	Yield	Capital Cost	O&M Cost
0	0	\$0	\$100,000	\$0
1	0	\$0	\$0	\$0
2	0	\$0	\$0	\$0
3	0	\$0	\$0	\$0
4	2	\$400	\$150,000	\$4
5	10	\$2,000	\$0	\$20
6	20	\$4,000	\$0	\$40
7	40	\$8,000	\$0	\$80
etc	etc	etc	etc	etc
49	100	\$20,000	\$0	\$200
50	100	\$20,000	\$0	\$200

# Costs to include

- All costs must be included regardless of who pays
- All capital, O&M, and future replacement
- Economic costs include opportunity costs of any resources (land, volunteer labor) committed to the project even if they were purchased in the past
- Opportunity cost is the market value of the resource now

# Benefits and Cost Savings

- Economic benefits are 1) the value of water quality or quantity improvements or 2) cost savings, both relative to without-proposal
  - Count 1) when
    - Without proposal, no other project would be implemented
    - Benefits are achieved only with the proposal
    - The effect of the proposal is to achieve a physical quality or supply benefit that would not otherwise be obtained
  - Count 2) cost savings when:
    - Without proposal, some other project would be implemented instead
    - Benefits are achieved with either proposal or project
    - The effect of the proposal is to avoid a cost
- 

# Benefits Hints

- For water supply, usually cost savings. If there is no supply alternative, might claim reduced shortage cost
- Economic impacts such as jobs or income created in construction are not benefits
- **Do not double count**
- Count only one type of benefit or cost savings for each unit of water supply produced
- Can count different types for different conditions
  - Hydrologic conditions: wet year, reduce purchases, dry year, reduce shortage
  - Planning horizon: short run, improve quality, long-run, avoid a future project

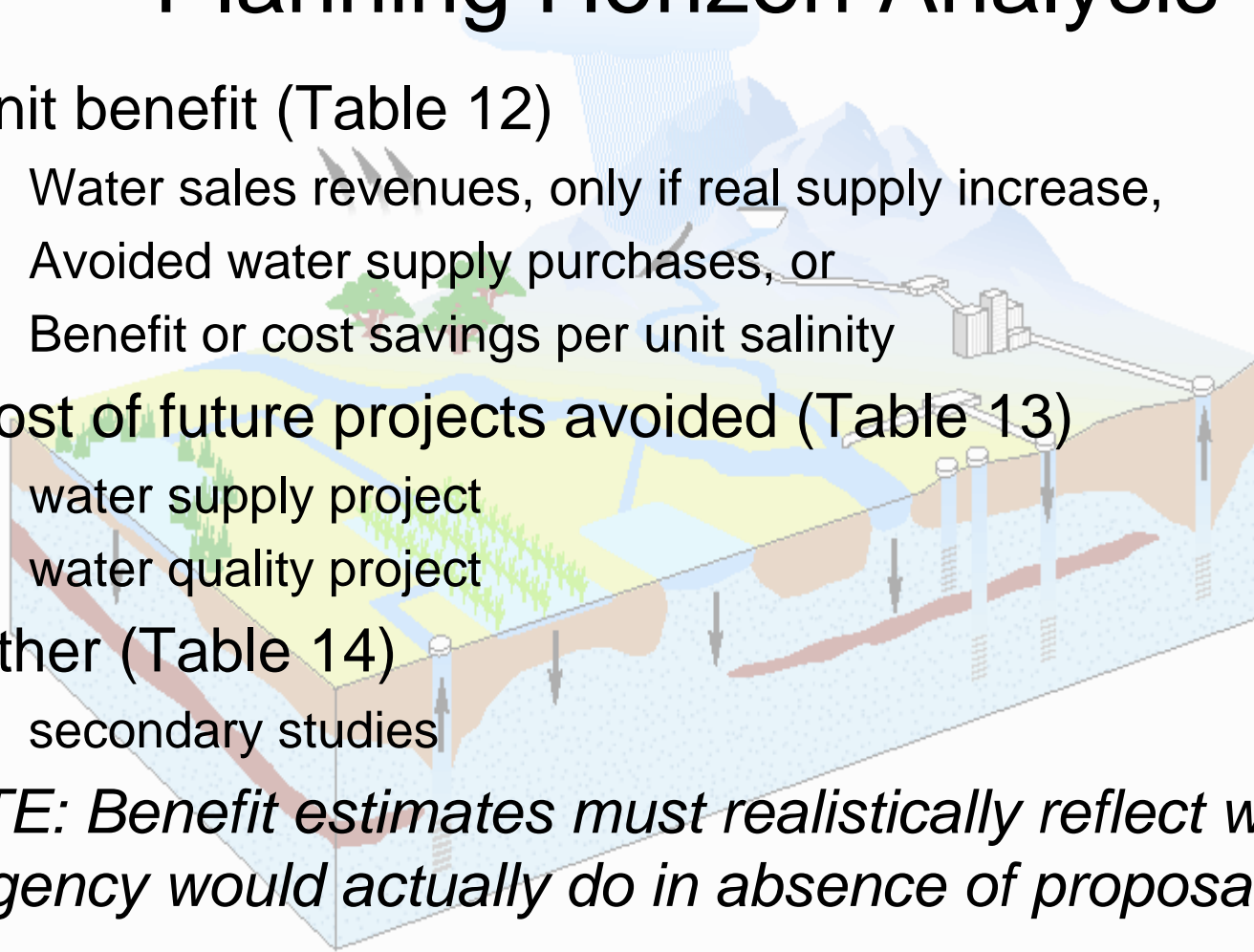
# Documenting Cost Savings and Benefits

- Describe what would happen (especially costs) in the future without the proposal
- Describe how proposal will be operated to obtain benefits claimed
- Document benefits thoroughly, including future conditions without and with the proposal
  - Past supply planning documents, Board minutes, land use plans
  - Make any past documentation of physical or economic benefits analysis available

# Benefits/Cost Savings Tables for Planning Horizon Analysis

- Unit benefit (Table 12)
  - Water sales revenues, only if real supply increase,
  - Avoided water supply purchases, or
  - Benefit or cost savings per unit salinity
- Cost of future projects avoided (Table 13)
  - water supply project
  - water quality project
- Other (Table 14)
  - secondary studies

*NOTE: Benefit estimates must realistically reflect what the agency would actually do in absence of proposal*



# **Water Quality Benefits**

- **Link Project Hydrology to Receiving Water Body**



- Identify Water Quality Standards
  - <http://www.waterboards.ca.gov/>
  - Regional Board
  - Water Quality Control Plan (Basin Plan)
  - Basin Plan Documents
  - Section 3. Water Quality Objectives (standards)

## SPECIFIC WATER QUALITY OBJECTIVES FOR NORTHE

<u>Waterbody</u> <sup>1</sup>	Specific Conductance (micromhos) <u>@ 77°F</u>		Total Dissolved Solids (mg/l)		Dissolved Oxygen (mg/l)		
	90%	50%	90%	50%	90%	50%	
	<u>Upper</u> <u>Limit</u> <sup>3</sup>	<u>Upper</u> <u>Limit</u> <sup>2</sup>	<u>Upper</u> <u>Limit</u> <sup>3</sup>	<u>Upper</u> <u>Limit</u> <sup>2</sup>	<u>Min</u>	<u>Lower</u> <u>Limit</u> <sup>3</sup>	<u>Lower</u> <u>Limit</u> <sup>2</sup>
<u>Lost River HA</u>							
Clear Lake Reservoir & Upper Lost River	300	200			5.0		8.0
Lower Lost River	1000	700			5.0		-
Other Streams	250	150			7.0		8.0
Tule Lake	1300	900			5.0		-
Lower Klamath Lake	1150	850			5.0		-
Groundwaters <sup>4</sup>	1100	500			-		-

# Estimate

- Change in Flow
- Reduction in Concentration
- Reduction In Loading
  - Units Per Time Period (X tons of sediment per day)

# Water Quality Economic Quantification

- Basin Plan Beneficial Uses (Section 2)
  - **State Water Resources Control Board  
Uniform List of Beneficial Uses (1996)**
- **Water Supply**
  - **MUN Municipal and Domestic Supply**
  - **AGR Agricultural Supply**
  - **IND Industrial Service Supply**
  - **PRO Industrial Process Supply**
  - **GWR Groundwater Recharge**
  - **FRSH Freshwater Replenishment**
  - **NAV Navigation**
  - **POW Hydropower Generation**

- **Recreation**
  - **REC-1 Water Contact Recreation**
  - **REC-2 Non-Contact Water Recreation**
- **Habitat**
  - **Comm Commercial and Sport Fishing**
  - **WARM Warm Freshwater Habitat**
  - **COLD Cold Freshwater Habitat**
  - **ASBS Preservation of Areas of Special Biological Significance**
  - **SAL Inland Saline Water Habitat**
  - **WILD Wildlife Habitat**
  - **RARE Rare, Threatened, or Endangered Species**
  - **MAR Marine Habitat**
  - **MIGR Migration of Aquatic Organisms**
  - **SPWN Spawning, Reproduction, and/or Early Development**
  - **SHELL Shellfish Harvesting**
  - **EST Estuarine Habitat**
  - **AQUA Aquaculture**

- **North Coast Region Beneficial Use Designations**
  - **Wetland**
    - **WET Wetland Habitat**
    - **WQE Water Quality Enhancement**
    - **FLD Flood Peak Attenuation/ Flood Water Storage**
  - **Traditional and Cultural Uses of Water**
    - **CUL Native American Culture**
    - **FISH Subsistence Fishing**

TABLE 2-1: BENEFICIAL USES OF WATERS OF

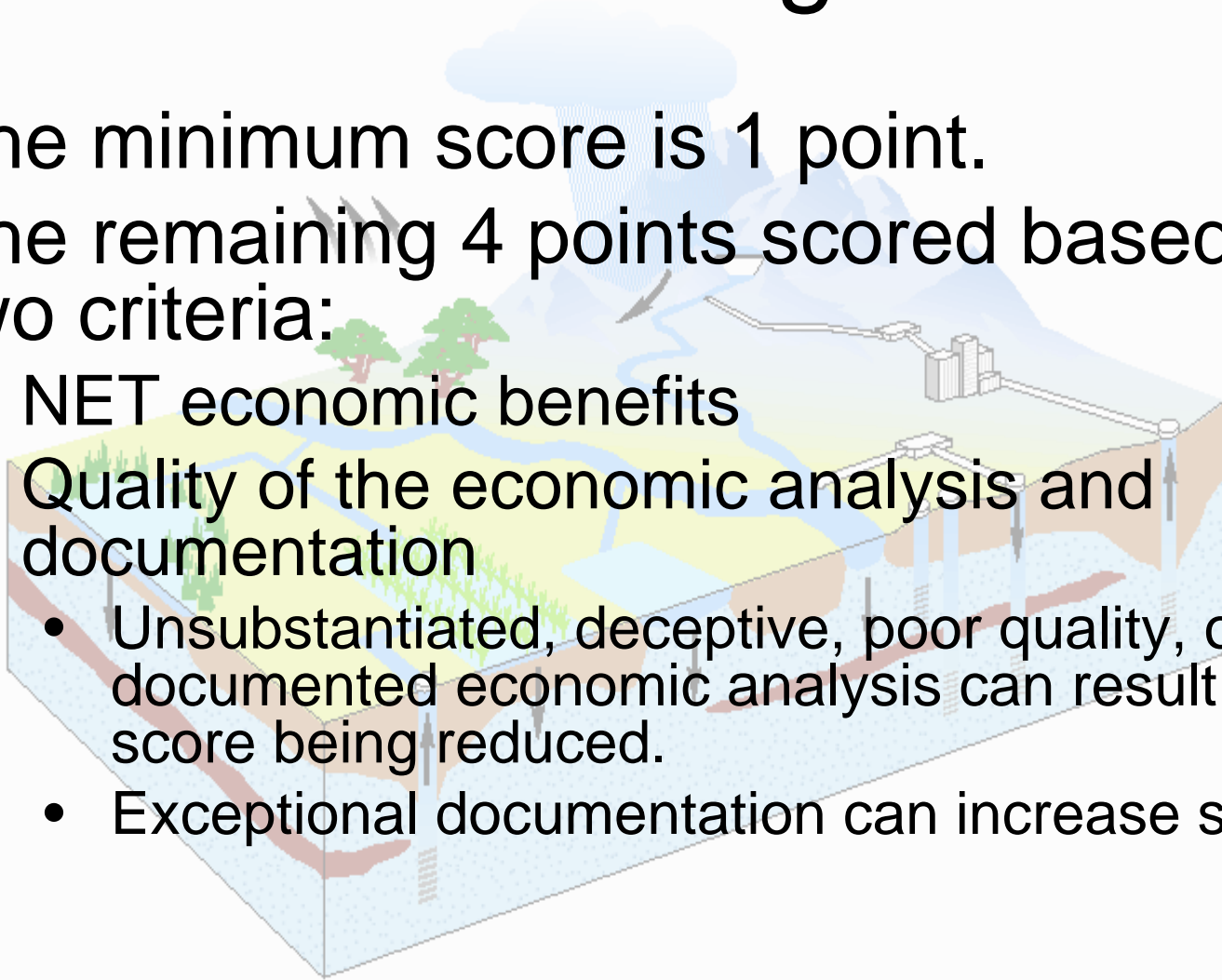
HU/HA/ HSA	HYDROLOGIC UNIT/AREA/ SUBUNIT/DRAINAGE FEATURE										
		MUN	AGR	IND	PRO	GWR	FRSH	NAV	POW	REC1	REC2
101.00	Winchuck River Hydrologic Unit										
	Winchuck River	E	E	E	P		E	E	P	E	E
102.00	Rogue River Hydrologic Unit										
102.20	Illinois River Hydrologic Area	E	E	E	P		E	E	E	E	E
102.30	Applegate River Hydrologic Area	E	E	E	E		E	E	P	E	E
103.00	Smith River Hydrologic Unit										
103.10	Lower Smith River Hydrologic Area										
103.11	Smith River Plain Hydrologic Subarea	E	E	E	P		E	E		E	E
	Lake Talawa	P					E	E		E	E
	Lake Earl	E	E	E			E	E		E	E
	Crescent City Harbor						E	E		E	E
103.12	Rowdy Creek Hydrologic Subarea	E	E	E	P		E	E	P	E	E
103.13	Mill Creek Hydrologic Subarea	E	E	E	P		E	E	P	E	E
103.20	South Fork Smith River Hydrologic Area	E	E	E	P		E	E	E	E	E
103.30	Middle Fork Smith River Hydrologic Area	E	E	E	P		E	E	E	E	E
103.40	North Fork Smith River Hydrologic Area	E	E	E	P		E	E	E	E	E
103.50	Wilson Creek Hydrologic Area	E	E	E	P		E	E	E	E	E

# Non-Market Values (Habitat, Recreation, etc.)

- National Ocean Economics Program
  - Non-Market Valuation Studies Database
    - <http://noep.mbari.org/nonmarket/NMsearch.asp>
- Beneficial Use Value Calculator Database (BUVC)
  - Over 3,000 Non-Market Values
  - Sorted by Beneficial Use

# Scoring

- The minimum score is 1 point.
- The remaining 4 points scored based on two criteria:
  - NET economic benefits
  - Quality of the economic analysis and documentation
    - Unsubstantiated, deceptive, poor quality, or poorly documented economic analysis can result in the score being reduced.
    - Exceptional documentation can increase score.



# Other Expected Benefits

- Types could include:
  - Ecosystem Restoration
  - Flood Control
  - Recreation and Public Access
  - Power Cost Savings or Power Production
  - Other Environmental Benefits
- Same economic principles apply

